

16. How Are Low-Level Radioactive Waste Disposal Facilities Monitored?

The purpose of an environmental monitoring program at a low-level radioactive waste disposal facility is to protect both people and the environment. Monitoring programs are designed to ensure that a disposal facility is in compliance with federal Nuclear Regulatory Commission (NRC) and Environmental Protection Agency (EPA) regulations.

One goal of the monitoring system is to detect any infiltration of water into the disposal facility so that remediation can be taken if necessary. In addition, air and water at and around the site are continually monitored so that if radioactive materials are in fact released from the disposal facility, they will be detected. Radiation monitors are extremely sensitive and can detect the release of low levels of radioactive materials, facilitating their early detection. This allows remedial action to be taken before any release poses a threat to public health and safety.

There are three phases to the environmental monitoring program:

- site characterization, including pre-operational monitoring;
- operational monitoring; and
- post-operational monitoring.

This Fact Sheet provides a brief description of these phases.

Site Characterization

The purpose of site characterization is to determine whether or not a low-level radioactive waste disposal facility can be properly and safely designed, operated, closed, and controlled after closure at a given location. During site characterization, a potential site is studied to determine whether it has characteristics that will enhance the facility's ability to confine the radioactive waste and

protect people and the environment. In addition, studies are conducted to determine whether the site can be monitored to detect promptly any release from the disposal facility. At this time, the site developer must also plan where monitors should be placed and how frequently measurements should be taken.

Pre-Operational Monitoring

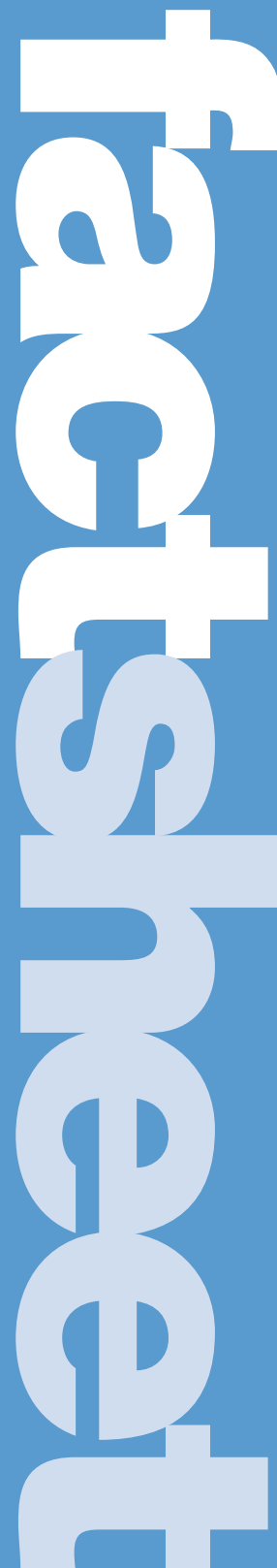
During pre-operational monitoring, data are collected and evaluated at and around the proposed site. Data will be collected on hydrology, meteorology, seismology, geochemistry, and social sciences, along with information on current background levels of radiation. The NRC requires data to be collected for at least one year for characteristics that are subject to seasonal variations. This includes data on:

➤ Hydrology

Hydrological monitoring involves both surface water and groundwater. Surface water is water found above the ground in lakes, streams, or rainwater. Groundwater is water found under the ground. For groundwater, data such as the distance to any aquifers below the proposed site location and the rate and direction of groundwater flow are gathered. These data are used to determine how quickly radioactive materials introduced into the groundwater could reach a public water supply. Surface water data include information needed to minimize the infiltration of water into the low-level radioactive waste disposal facility.

➤ Meteorology

Meteorological monitoring determines the atmospheric dispersion of radioactive materials should an airborne release ever



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occur. Some examples of the conditions monitored include wind speed and direction, precipitation, relative humidity, temperature, and barometric pressure.

► **Radiology**

Air, water, and soil at the proposed disposal facility site are monitored for the presence of radioactive materials. Some natural radioactive materials will, of course, be present at every site. Initial concentrations (also called baseline levels) of these materials, such as naturally occurring minerals and fallout from weapons testing, are measured. During the operational phase of the disposal facility, the concentration of radioactive materials will continue to be monitored and compared with these baseline levels. This comparison will be used to ensure the integrity of the disposal facility. If an increase in radioactive material is detected, the point of release can be located and remediation efforts can begin.

► **Seismology**

A history of known earthquakes that might have affected the site area is compiled. Seismic information will be obtained from such sources as the National Oceanic and Atmospheric Administration and the North-East Seismic Network.

► **Geochemistry**

Groundwater samples will be collected from the selected monitoring wells for geochemical analysis. These analyses will provide a basis for understanding how rock and soils on the site will interact with air, water, and the waste to be disposed of in the facility, and how these interactions may affect the ability of the site to contain the waste.

► **Social Sciences**

Information will be collected for the site and surrounding area on existing land uses; population statistics and projected growth patterns; transportation access to the site;

zoning and other jurisdictional constraints; and cultural, historical and archaeological resources. This information will be used to identify both areas and populations that may potentially be affected by development of the proposed facility and to identify land-use activities that may have a potential impact on the proposed facility.

Operational Monitoring

Collection of meteorological data continues during the operational phase. Periodic re-evaluation of geological and hydrological data will allow detection of any changes that may occur.

Air quality also will be monitored both at and around the low-level radioactive waste disposal facility. The on-site monitoring of radioactive material in the air can provide an early indication of any releases from the disposal facility. Off-site air monitoring is conducted for two reasons. First, it detects any changes in the background radiation levels so that baseline values, against which operational data are compared, can be adjusted. Second, off-site air monitoring can indicate the presence of radioactive material from other sources that might affect the environment or local population.

Water quality is monitored during the operation of a low-level radioactive waste disposal facility. Groundwater and surface water at and around the disposal facility site are monitored for the presence of radioactive materials above baseline levels. Also, the direction, rate, and velocity of water flow around the site are periodically updated.

Soils, crops, and animals (both domestic and game) are also tested for changes in the levels of radioactive materials present.

Post-Operational Monitoring

The post-operational monitoring phase begins when the low-level radioactive waste disposal facility is closed, capped, and no longer accepting waste. The license holder

(the company that operated the facility), must continue all monitoring activities for at least five years after closure. In addition, the site owner, the State of New Jersey, will continue to monitor for as long as the State and host community deem necessary after closure, or for at least 100 years.

After closure of the disposal facility, groundwater is the most likely route for migrations of radioactive materials from the disposal site. As a result, many of the post-operational monitoring activities concentrate on groundwater. Air, soil, and vegetation are monitored as well. The data collected during this phase are compared with similar information collected during the operational and pre-operational monitoring programs.

► **For More Information**

If you want to read more about monitoring programs at low-level radioactive waste disposal facilities, some of the references listed below may be helpful.

- Code of Federal Regulations, Title 10, Part 61, "Licensing Requirements for Land Disposal of Radioactive Waste", 1992.
- *Low-Level Waste Management Handbook Series: Environmental Monitoring for Low-Level Waste Disposal Sites*, DOE/LLW-131G, Vol. 1, EG&G Idaho, Inc., Idaho Falls, February 1990.
- See also *Fact Sheet # 4: "How is Ionizing Radiation Measured?"*

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